The effect of board gender quotas on the financial performance of companies: Evidence from France

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ABSTRACT,

In today's dynamic business landscape, numerous studies have explored the relationship between board gender quotas and the financial performance of companies. However, the outcomes of these studies have been diverse, presenting a range of conclusions. Building upon this existing body of research, this paper examines the effect of board gender quotas on firm performance in France. Using a Differences-in-Differences analysis for the period from 2008 to 2017, the study analyses a market-based measure as well as accounting-based measures to measure firm performance. The study makes use of three different regression models, based on the Ordinary Least Squares method and the Fixed Effects method. The findings reveal mixed results for a sample of 108 firms from the SBF120 index, with mostly weak and statistically insignificant coefficients for the financial performance measures. Therefore, this study supports the existing evidence stating that there is no significant effect of board gender quotas on the financial performance of companies. With an increasing number of countries implementing board gender quotas aimed at promoting gender diversity and equality in corporate leadership, this research offers useful empirical guidance to regulators on the issue.

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Keywords

Female directors
Gender quotas
Gender diversity
Firm performance
SBF120
France

1. INTRODUCTION

As of 2018, women held 16.9% of all global board seats and only 5.3% of board chair positions (Deloitte, 2022). There has been much debate about the representation of women on boards. The announcement of females on boards result in either a negative effect (Ahern & Dittmar, 2012), a positive effect (Campbell & Minguez-Vera, 2008) or a negligible market response (Farrel & Hersch, 2005). But despite the varying perspectives and inconsistent findings, there is strong advocacy to increase the representation of women in upper-level management (Chen *et al*, 2019). Around the world, women face significant obstacles to career advancement (Karam & Jamali, 2013). To achieve a higher amount of women on corporate boards, affirmative action rules are globally being implemented. This is the policy of favouring individuals who are being discriminated. In other words, groups that are disadvantaged within organisations. These affirmative action rules are often also known as "gender quotas" (Terjesen & Sealy, 2016).

In 2003, Norway was the first country in Europe that passed a law mandating 40% representation of both women and men on the boards of public companies by 2008 (Garcia-Blandon *et al*, 2022). Since then, more and more European countries have legislated similar rules. European countries like Austria, Belgium, France, Germany, Iceland, Italy, the Netherlands, Portugal, and Spain followed soon (Terjesen *et al*, 2015). As a result, the amount of women representation on boards of the largest publicly listed companies in the European Union increased from 9% in 2003 to more than 23% in 2016 (Comi *et al*, 2020).

In leadership positions, gender stereotypes continue to be a bigger barrier for women's career progress than they are for males. The goal of placing female representation quotas on corporate boards is to eliminate the gender gap in economic participation and to support women's advancement within organisations (Neschen & Hügelschäfer, 2021). The main arguments for a more equal representation are twofold. The first is the principle of equality, which states that equal cases should be treated equally. A morally relevant difference can be identified by a difference in treatment (Kvalnes, 2015). The second argument is that the more diverse a company's board, a better company performance can be reached. Equal gender ratios in the workplace are said to increase productivity, improve the working atmosphere and promote sex equality (Madison, 2019).

Gender quotas are being imposed by the government on corporations. This means that a rationale is applied of unequal treatment to compensate for other forms of bias. To achieve a specific proportion of women on boards, a quota is used. This is the selection of people for positions based on their membership in a group to reach a certain proportion. In this case, the groups are either men or women. In other words, bias is used to reach a different, typically more equal, board composition than otherwise would have been the case (Madison, 2019). Since governments are imposing corporations to use this bias, it is interesting to look at this from an organisation's point of view. Are organisations satisfied with mandatory implementation of gender quotas? In fact, the ultimate goal of organisations is to choose boards that maximise firm value (Ahern, 2012).

Opponents of gender quotas argue that quotas are a symbolic mean rather than meaningful representation (Teigen, 2012). On the other hand, some suggest that quotas can help close the gender gap by encouraging women to compete and have a wider search for candidates (Neschen & Hügelschäfer, 2021). I want evidence to see whether a positive, negative or negligible effect can be found by looking at the implementation of gender quotas. Atinc *et al* (2017) find that it takes time for changes on boards to have effect on firm outcomes. Therefore, I investigate a country that has implemented mandatory gender quotas on boards, with enough time before and after this implementation. France is an important country with regards to its economic value. In France, the civil law system is in place. Minority shareholders receive less protection under this system (La Porta *et al*, 2008). That means the role played by the monitoring-related traits of female directors is more significant. Next to that, French corporations are characterised by concentrated ownership and a split between ownership and control (Faccio & Lang, 2002). This could lead to a greater contribution of female directors through their talents in this setting (Bennouri *et al*, 2018).

This research examines if gender quotas will lead to a positive, negative or non-significant financial effect on listed corporations. Therefore, to contribute to a better understanding of the effect of board gender quotas on financial performance in France, the following research question is investigated:

What is the effect of board gender quotas on the financial performance of companies in France?

The paper is organised as follows: Section 2 reviews the relevant literature related to board gender diversity, board gender quotas and France's institutional background. The relevant hypotheses are explained in Section 3, while the methodology is explained in Section 4. Section 5 discusses the sample, summary statistics and correlation matrix. Section 6 further examines the results of the analyses and Section 7 concludes the study.

2. LITERATURE REVIEW

2.1 Board Gender Diversity

Effective corporate governance results in organisation's positive financial results. According to the agency theory, a monitoring body has to be in place in the name of the shareholders. The board of directors serves as the company's direct shareholder representative and has a controlling and monitoring role in advancing the interests of shareholders (Pechersky, 2016). The board of directors guarantees that the interests of shareholders and managers are closely aligned and is able to discipline or dismiss unproductive management teams (Kang *et al*, 2017).

Much literature argues that diverse boards can produce better monitoring and controlling. Different industry backgrounds, culture, age, gender and geography imply a range of perspectives, which in turn result in a better level of board independence. Independency is one of the elements influencing higher management performance (Pechersky, 2016). In fact, there is growing evidence that male boards are outperformed by gender-diverse boards (Harjoto *et al*, 2015). The case for gender-diverse boards performing better than all-male boards is emerging. Research suggests that organisations benefit from having more diversity on their boards (Richard, 2000). Through wise management choices, diverse boards serve stakeholders' interests. Board choices become more thorough as a result of board diversity, which brings a wide range of information and abilities that develop various views (Harjoto *et al*, 2015).

Research suggests that there is a wide consensus that achieving gender balance on corporate boards is becoming a goal globally. Campbell & Minguez-Vera (2007) find that there is a positive impact of the diversity of the board (percentage of women) on firm value. Bennouri *et al* (2018) find that female directorship increases accounting-based performance measures (ROE and ROA). Next to that, Slama *et al* (2019) find that boards with a level of 40% women show that accounting performance reaches the highest level.

On the other hand, research argues that there is no correlation between board composition and company performance. It argues that board composition does not matter (Hermalin & Weisbach, 1991). Also, moving to psychological theory, research suggests that greater geographical heterogeneity leads to less cohesion and collegiality. Furthermore, it could lead to more conflict on the board of directors (Putnam, 2007).

To conclude, the relevance of gender equality and gender diversity has increased as a result of strict governance procedures. One of the topics in particular that has drawn more attention in recent years is board composition (Kang *et al*, 2017). Board composition should have an important role in a company's performance, and diversity is generally regarded as beneficial (Mannix & Neale, 2005).

2.2 Board Gender Quotas

There are several psychological theories that might be used to explain why gender differences occur. One is that men prefer working with things, while women prefer to work with people. This is often known as systemising and empathising respectively (Baron-Cohen, 2002). For people that fall in the extremes of either systemising or empathising, a preference in choosing new board members occurs. Examples of jobs for women related to these extremes are hairdresser, psychotherapist, social worker and nurse. For men these are carpenter, auto mechanic, bricklayer and computer technician (Baron-Cohen *et al*, 2003). For the appointment of new members in the board of directors, preference in choice is also relevant. Next to the relatively small number of female corporate leaders serving as symbolic token gender representatives (Kanter, 1977), there are strong homophily preferences in board appointments (Westphal & Milton, 2000). Therefore, increased higher education for women and better work participation have not been in line with the increase of representation of women on corporate boards (Baron-Cohen *et al*, 2003).

As a barrier to their professional advancement, gender stereotypes still affect women in leadership roles more than they do males (Adnan & Miaari, 2018). Evidence suggests that gender-diverse boards outperform boards filled only with men (Terjesen & Sealy, 2016). Therefore, governments and corporate entities put affirmative action policies in place to support underrepresented groups during the hiring process in order to advance women's careers (Terjesen *et al*, 2015). By requiring a wider search for candidates and motivating women to compete, research suggests that a quota for women can help decrease the gender gap in participation (Balafoutas & Sutter, 2012). Next to that, Comi *et al* (2020) suggest that gender quotas show a significant positive effect on the financial performance of companies. The scope of the decision-making process is broadened (Bart & McQueen, 2013), vigilance and monitoring efforts are strengthened (Triana *et al*, 2014), and companies are less likely to engage in accounting fraud and present their financial information with greater transparency (Abdullah & Ku Ismail, 2013).

But, the implementation of board gender quotas in the majority of countries sparks scepticism. Also, it is accompanied by lively discussions about the possible consequences on company's performance and the economy as a whole (Maida & Weber, 2020). The relevance of having female role models and the necessity of increasing gender diversity in senior positions is underlined by proponents. Additionally, exposure to female board members ought to change preconceived notions about women in leadership roles and lessen statistical prejudice. The legislative restrictions on the company's ability to choose the best board member options and the dearth of qualified female board candidates concerns opponents that they would have a negative impact on company's performance (Maida & Weber, 2020). Other research suggests that the optimal governance structure differs per firm. Every firm faces its own management problems and has to come up with its own solutions for this. That means that binding regulations, like gender quotas, would actually not be beneficial for an organisation. It would hurt shareholders by requiring them to implement a new board structure, which would not be the best for their firm (Hermalin & Weisbach, 1991). Research suggests that this could also result in negative effects for public companies (Ahern & Dittmar, 2012). They explain the results by speculating that companies may be compelled by law to appoint directors who are younger and less experienced.

2.3 Institutional Background France

To find the effect of gender quotas, the French environment is a good laboratory for this study. In France, gender quotas have been legislated since 2011 (Soulier Avocats, 2016), so there is enough financial data available for the period before and after the implementation. Also, because of the civil law system in France, there is a weak shareholder protection environment. This could result in a more significant role of directors in companies (Post & Byron, 2015). Also, French firms are characterised by concentrated ownership and a separation of ownership and control, coupled with a highly concentrated ownership (Faccio & Lang, 2002).

In 1995, the Japan Women in Development Fund (JWIDF) of the United Nations Development Programme (UNDP) was found. The fund supports national capacities in promoting gender equality and the empowerment of women through innovative projects that broaden and sustain women's opportunities. It was the start of a new era. The European Union is mostly leading this trend and in 2009 the Grésy Report was published. The report, written by Mrs. Grésy, presents suggestions to increase the number of women on supervisory and board of director positions. First, it was intended to analyse how men and women are treated differently when it comes to access to employment and professional advancement, as well as how women are viewed in terms of decision-making. Additionally, proposals for improving the participation of women on the boards of directors of private and public companies were requested in the report. Most importantly, it proposes "to establish an obligation to have 40% of directors of the under-represented sex on boards of directors and supervisory boards, within six years, for public companies and companies whose shares are admit-ted to trading on a regulated market, by adding a criterion of size (1000 employees)" (Maselot & Maymont, 2014).

The French legislature passed a regulation in January 2011 requiring eligible listed firms to have at least 40% female directors by 2017. This was done in response to the obvious need for change. The 'Copé-Zimmermann' law requires public companies, among others, to include 20% of women on their corporate boards in 2013. Effective as from 2017, a minimum of 40% of women on corporate boards of public companies has to be met according to the law (Soulier Avocats, 2016). The law states that the appointment of board members in contrary to the law can be subject to annulment and considered invalid (Comi *et al*, 2020). A directive on improving gender balance among non-executive directors of companies listed on stock exchanges was recently proposed by the European Commission, with the goal of having 40% of the underrepresented sex in non-executive board positions by 2020 (Maselot & Maymont, 2014).

Next to that, France even strengthens its gender diversity regulation. In 2021, the 'Rixain Law' was adopted, which provides new rules regarding mandatory gender diversity for

French companies. Large French companies (more than 1,000 employees over the past three years) of any corporate form will be required to make sure that the proportion of the two genders in their senior executives and members of their management bodies may not be less than 30% as of the first of March 2026. As of the first of March 2029, this quota will rise to 40% (Reffay, 2022).

3. HYPOTHESES

Based on the literature review, there are three relevant hypotheses.

Hypothesis 1: There is a significant positive effect of gender quotas on the financial performance of public company boards in France.

Firstly, Campbell & Minguez-Vera (2007) find that organisations with a diverse board generally perform better in terms firm value. Secondly, Bennouri *et al* (2018) find that female directorship increases accounting-based performance measures. Thirdly, Comi *et al* (2020) suggest that gender quotas show a significant positive effect on financial performance. This is in line with the research of Slama *et al* (2019), who suggest that accounting performance reaches the highest level on boards with a level of 40% women. Therefore, I hypothesise that the implementation of gender quotas in public company boards in France has a positive impact on financial performance.

Hypothesis 2: There is a significant negative effect of gender quotas on the financial performance of public company boards in France.

Firstly, Putman (2007) suggests that heterogeneity could lead to more conflict on the board of directors. According to Maida & Weber (2012), the legislative restrictions on the company's ability to choose the best board member options concerns opponents that they would have a negative impact on company's performance. Requiring them to implement a new board structure, which would not be the best for their firm (Hermalin & Weisbach, 1991). Also, Ahern and Dittmar (2012) find negative effects for public companies due to gender quotas. Therefore, I hypothesise that the implementation of gender quotas in public company boards in France has a negative impact on financial performance.

Hypothesis 3: There is no significant effect of gender quotas on the financial performance of public company boards in France.

While some studies suggest a positive or negative effect of gender quotas on financial performance, Hermalin and Weisbach (1991) argue that board composition does not matter for company performance. Also, findings from Denmark and the Netherlands state also that there is no relation between board diversity and firm performance (Marinova *et al*, 2016). Next, Farrell & Hersch (2005) find that although better performing firms tend to have more women on the board, they cannot draw the conclusion that more gender diverse boards lead to better company performance. This is in line with the research of Teigen (2012), who argues that quotas are a symbolic mean rather than meaningful representation. Therefore, I hypothesise that the implementation of gender quotas in public company boards in France has no significant effect on financial performance.

4. METHODOLOGY

I obtain the financial and board composition data of public firms in France from Refinitiv Eikon. The data is retrieved for the period from 2000 to 2023, encompassing a substantial time frame that enables a comprehensive analysis of the public firms' landscape in France. By utilising the data available from Refinitiv Eikon, this study aims to shed light on various aspects of financial performance and board composition within the context of French public firms.

4.1 Sample

To identify whether gender quotas have an effect on the performance of firms, I implement measures to mitigate the potential influence of confounding external factors on the observed empirical evidence. The gender ratio can be affected by a large number of variables that also affect the performance. But, in most countries gender quotas have an immediate intervention, meaning that companies should adhere to the minimal proportion of women on boards at a certain point in time. This allows me to make a direct comparison of the same firms before and after the gender quota has been implemented (Madison, 2019).

I obtain the financial and board composition data of public firms in France from the Société des Bourses Françaises 120 (SBF120) index, which is a French stock market index. The index is based on the 120 most actively traded stocks in Paris. This research uses the data retrieved from the SBF120 index to do a Differences-in-Differences analysis of firms in France. I look at the needed increase of women on an organisation's board and see what the impact is on the financial performance. For instance, some firms do not need an increase, because these already meet the 40% quota. Other firms need an increase from 20% to 40%. I investigate the effect if a larger increase results in significantly more evidence of a change in financial performance.

The initial sample comprises 119 out of the 120 firms included in the study, as one firm either chooses not to disclose or is unable to publish its financial information. The sample period encompasses the years 2008 to 2017, consisting of three years preceding the implementation of the mandatory gender quotas policy (specifically, 2008, 2009, and 2010) and seven years following the policy change (from 2011 to 2017).

I follow the literature by removing companies from the financial sector from the sample. These firms could possibly bias the results (Sila *et al*, 2016). Compared to women entering other business industries, women entering the financial sector tend to be less risk-averse. This implies that the gender-risk findings from the banking industry may not apply to other industries and calls for a more comprehensive investigation into the risks associated with increased female diversity on the boards of non-financial enterprises (Sapienza *et al*, 2009). Next to that, the boards of non-financial firms differ from boards of banks. Boards of banks are more independent and larger. Also, directors of financial and real estate firms have higher liability risks than directors of non-financial organisations due to their varied regulatory regimes (Adams & Mehran, 2012). Since there are eleven firms in the financial sector, the sample is left with 108 firms.

4.2 Board Composition

The independent variable of the analysis is the percentage women on the board of an SBF120 firm. This is calculated by the amount of women on the board divided by the sum of the amount of men and women on the board. The output gives the percentage of women on the board for each year from 2008 to 2017.

First, I clean the data for the independent variable. The retrieved data consists of two parts: previous officers and current officers. The previous officers are characterised by their names, with or without a prefix. Also, they are given the start-date and end-date of their period as a director on the board of directors. The current officers are characterised by their names, with or without a prefix as well. They are given their "current position", which can include multiple positions simultaneously within the firm. I also know the time period that they have been active as an officer or director. I assume that this period is the period they have been active as a director specifically.

I write a code in R to create an output in which a clear overview is given for the board composition. This includes finding the start row and end row for the data frame of each firm, since these all have a different amount of previous and current directors. Next, I create new columns in which the board members are copied if they are active in that specific year. I name these columns "Active_YYYY". For the previous officers, I exclude people that have not been active as a director. Furthermore, I copy directors active in a year of the specified time frame within that specific column. For the current officers, I assume that their position can be identified by the name of their current position. By comparing the data with specific board composition information of companies, I code the following inclusions and exclusions (ignore capitals for each case):

Prioritise	"Chairman of the board"
Exclude	"Member of (the) executive committee", "Member of (the) executive board" and "Chairman of the management board"
Include	"Chairman of the board", "Non-Executive (Independent) Chairman of the Board", "Independent chairman of the board", "Executive chairman of the board" and "Non-Executive Vice Chairman of the Board"

I create three new rows: one to count the number of women per year, one to count the number of men per year and one to calculate the percentage of women on the board of the firm for a specific year.

Most directors are characterised by a prefix, from which I can retrieve the gender. This is not the case for every director, so for these directors I guess their gender. French names include a lot of exceptions. For example, the name Dominique is sometimes regarded as male or as female. Therefore, I guess the gender by recognition and by searching the person on the internet. For the totals, I sum the number of men based on the prefixes "Mr.", "Lord" and "Bn" and the number of women based on "Mrs.", "Ms." And "Miss".

Finally, I calculate the percentage by dividing the counted number of women per year by the sum of both counts (men and women). I run this code for each firm.

4.3 Financial performance

According to Venkatraman & Ramanujam (1986), financial performance is defined as "centers on the use of simple outcome-based financial indicators that are assumed to reflect the fulfillment of the economic goals of the firm".

Researchers typically employ metrics of either accounting performance or market performance to show a firm's financial performance level. There is an implicit understanding that the financial performance construct has two dimensions: accounting-based measures and market-based measures (Rowe & Morrow, 1999). Both measures can be manipulated by management and owners. But, when both measures are used, information asymmetry is minimised (Tho *et al*, 2021).

My primary measures of financial performance are Tobin's Q (TOBQ), Return on Assets (ROA), Return on Equity (ROE), and Return on Sales (ROS). TOBQ as market-based measure and ROA, ROE, and ROS as accounting-based measures. The variables are defined in Appendix Table A1. TOBQ measures the market's expectations of future earnings and is a good proxy for a firm's competitive advantage (Montgomery & Wernerfelt, 1988). Firms with a ratio higher than 1.0 are likely to be able to increase value by effectively utilising their resource base. Also, TOBQ takes risk into account, unlike accounting measurements (Lindenberg & Ross, 1981). Next, the accounting measure ROA is one if the most commonly used ratios in previous studies to measure firm performance (Vo & Nguyen, 2014). It is expressed as the net income divided by the average total assets of the company (Adams & Ferreira, 2009). Next to ROA, I use ROE and ROS as accounting-based variables. ROE is often used in the literature (Ahmadi et al., 2018; Low et al., 2015; Lückerath-Rovers, 2011). It is measured as the net income divided by the total shareholder's equity (Joecks *et al*, 2013). Lastly, ROS is suggested as a good proxy for ROA (Liu et al., 2014; Smith et al., 2006). It is measured as the net income divided by the total of sales (Lückerath-Rovers, 2011).

4.4 Regression Analysis

4.4.1 Differences-in-Differences

In a Differences-in-Differences (DiD) analysis, two groups are compared: one that is hit by a change and one that is not. A change is in this case a policy change: gender quotas. In the sample, all firms are hit by this policy. Therefore, the groups are divided according to the extent of change required for the firm's board. Some firms are affected less by the policy and some firms are affected more. This relates to the starting situation before the policy, in the year 2010. In 2010, some firms already have a certain amount of women on their boards and some firms do not. Therefore, I split the two groups based on the median of the pre-quota female ratio in 2010 (PRE_RATIO). One below the median and one above the median (median = 10%). "LOW" is the group with a lower pre-quota female ratio on the board. This is characterised as the 'treated group', while the 'control group' is the group with a high pre-quota female ratio on the board:

Treated Group	= 1 if pre-quota female ratio < 10%
Control Group	= 0 if otherwise (high)

Next, I define the time period before and after the policy change. Since the policy is mandated in 2011 to have at least 20% women on board in 2013, this is the event time. Therefore, I define the following variable:

POST	= 1 if YEAR > 2010 (post-treatment period)
POST	= 0 if otherwise (pre-treatment period)

In the DiD analysis, I use two different methods to estimate the coefficients in the analysis. According to Liu *et al* (2014), there are two methods commonly used in the literature on firm performance and board diversity.

The first method is the Ordinary Least Square (OLS) method, which estimates the coefficients of a linear equation that relates a response variable to one or more predictor variables (Hair *et al*, 2014). The OLS method is considered a good way of analysing results, but has the disadvantage that there could be an endogenous relationship. According to Wintoki *et al* (2012), endogeneity can result in skewed and inconsistent coefficient estimates, which prevents the drawing of a trustworthy

conclusion. The second method is called the Fixed Effects (FE) method. When OLS is used, the inclusion of omitted or unobserved firm- and time-specific heterogeneity might cause estimates to be biased (Sabatier, 2015). Therefore, the FE method estimates the coefficients of a linear equation that relates a response variable to one or more predictor variables. It performs fixed effects regression, also known as within-group or entity-specific regression. Here, the model examines whether intercepts differ across groups or time (Park, 2011), which is commonly used in panel data analysis.

4.4.2 Assumptions

To mitigate any inconsistent coefficient estimates, the regression analysis takes several assumptions into account. The main assumptions for the OLS method as well as the FE method are as follows.

First, the Parallel Trends Assumption, which states that in the absence of treatment, the average trends in the outcome variable for the treatment group and control group follow a similar path over time. If not, there is too much influence of other factors on both groups, so the post-treatment effect is unreliable. I test the Parallel Trends Assumption via graphical analysis. I plot the four financial measures against the percentage of women on boards and visually inspect the trend before the treatment period. The treatment and control group should both approximately have parallel trends in the pre-quota period.

Second, I follow the assumption that all variables are numerical. Only numerical variables can be used in a DiD analysis (Hair *et al*, 2014).

Third, I assume homoscedasticity. This means that the errors or residuals have constant variance across all entities and time periods. To test if homoscedasticity holds, I do the Breusch-Pagan test to assess whether the residuals exhibit unequal variances across different levels of the independent variables (Fox, 2015).

Lastly, the OLS method assumes normality of errors or residuals. The FE method relaxes this assumption, because this method ensures that the error terms are not correlated with the independent variables. To test whether the OLS method has normal distributions, I conduct a Shapiro-Wilk Test to assess the deviation of the residuals from normality.

If both the assumption of homoscedasticity and normality do not hold, the model is heteroscedastic and does not have a normal distribution. This could imply that the standard errors, hypothesis tests, confidence intervals, and *p*-values may be unreliable. To mitigate these effects, I use robust standard errors (Liu *et al*, 2014). They adjust for the potential unequal variance of errors across different observations within the dataset.

4.4.3 Models

To test the hypotheses, I conduct the OLS method and the FE method with multiple regression analyses. First, I want to know the bivariate relationship between the independent and dependent variables, without the complexity of considering other factors. Next to that, I conduct a regression analysis including control variables to account for potential confounding factors and provide a more accurate and robust estimation of the relationships. Third, I conduct a regression analysis with fixed effects.

The following is the main regression model:

$$\text{Financial\_Performance}_{it} = \beta_0 + \beta_1(\text{LOW})_i + \beta_2(\text{POST})_{it} + \beta_3(\text{POST})_{it} + \beta_4(\text{LOW})_i * (\text{POST})_{it} + \beta_5(\text{CONTROL})_{it} + \varepsilon_{it}$$

LOW represents the dummy variable to define the treatment group and the control group. POST is a dummy variable as well, which defines the periods before and after the policy implementation. CONTROL is measured by the different control variables (BSIZE, FSIZE, FAGE, and LEV). ε is the error term, i represents the firms and t is the time.

The first model does not take control variables into account. It examines the average treatment effect without controlling for any potential confounding factors.

The second model does take control variables into account. The financial performance will change over time, even when there is no policy (change). This needs to be controlled. Therefore, in addition to the treatment status or time indicators, I use control variables to account for potential confounding factors that may influence the outcome variable. I include four control variables. The first three relate to the structure of the firm. These are Board Size (BSIZE), Firm Size (FSIZE), and Firm Age (FAGE). The fourth variable relates to the growth potential and riskiness of the firm, which is Leverage (LEV).

For both models, "β_4" is the estimate for the coefficient for $(\text{LOW})_i * (\text{POST})_{it}$. The estimated coefficient of this interaction term shows the effect of the policy. I test the three hypotheses with the outcomes of this coefficient to see whether gender quotas affect firm performance positively, negatively or if there is no significant relationship between the two.

The third model is the Fixed-Effects model. This looks as follows:

$$\text{Financial\_Performance}it = \beta_0 + \beta_4(\text{LOW})_i * (\text{POST})_{it} + \beta_5(\text{CONTROL})_{it} + \text{Year\_FE}_t + \text{Firm\_FE}_i + \varepsilon_{it}$$

Next to the control variables, the FE method takes two fixed effects into account. This helps to account for any systematic differences in the outcome variable, associated with different years and categories. The first fixed effect is the variable Year_FE, which allows to control for any time-specific factors that may affect the outcome variable. It includes fixed effects for each unique value of the YEAR variable, ranging from 2008 to 2017. Next to that, the firm fixed effects are taken into account, which controls any unobserved heterogeneity. This indicates the variable Firm_FE. For each firm, it captures the firm-specific effects. Since the Year FE and Firm FE are taken into account, the model already controls individual-specific or entity-specific effects. Therefore, I exclude the reference categories LOW and POST in this model.

5. DATA DESCRIPTION

5.1 Women on boards

Figure 1 presents the average percentage of women over time for the whole period retrieved from Refinitiv Eikon. It shows a positive curve, starting from 2000 to 2023. The curve gradually increases from about 6% in 2000 to 46% in 2023. Before 2009, on average there is a low increase of women on boards. In fact, an increase of about 3% from 2000 to 2008. In 2009, the Grésy Report was published. From 2009, an increase of the percentage of women on boards is observable. After the policy change in 2011, the slope of the graph gets steeper, to reach the quota in 2013. In 2013, the figure shows an average percentage of women on boards of 23%, which means that the mandatory gender quota of 20% is reached by the average percentage of women on corporate boards this year. The next quota is 40% in 2017, where the average percentage of women on boards equals approximately 38%. This is lower than the mandated 40%. Various underlying factors may underpin this lower percentage. Such as that some firms manipulate the ratio women on its board or do not count certain directors on the board of its directors. Another plausible explanation may be that firms with a lower percentage pay the fines related to it. After 2017, Figure 1 shows

a decreasing slope and the average percentage of women flattens. In 2023, the average percentage of women on boards equals about 46%.

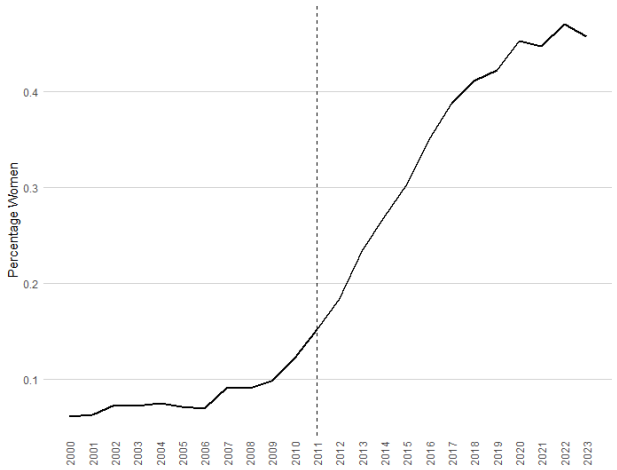


Figure 1. Average percentage of women on boards over time.

In summary, Figure 1 illustrates the upward trajectory of the average percentage of women on corporate boards from 6% in 2000 to 46% in 2023. The implementation of gender quotas in 2011 leads to a significant increase, although achieving the subsequent 40% quota in 2017 poses challenges.

5.2 Summary statistics

Table 1 presents the summary statistics for the main variables used in the analysis. The definitions of the variables are explained in Appendix Table A1. Several measures are taken to mitigate the effects of outliers. First, I winsorize the continuous variables at the 1% and 99% levels. This applies for all variables in the table, except %WOMEN, because this is the independent variable and includes the raw percentages for the number of women on boards. Table 1 shows the new 1st and 99th percentile, indicated with P1 and P99 respectively. For instance, for TOBQ a 99th percentile means that 99% of the data falls below 41.87. Second, I take the natural logarithm for both FSIZE (in millions) and FAGE. This helps to ensure better comparability to the other variables.

Table 1 shows that 22% of all directors are women in the full sample, which means that overall women fill less places on corporate boards than men. This is in line with the research of Liu *et al* (2014), who find that 10.2% of all directors are women. For the control variables, Table 1 shows that there are various kinds of firms in the sample. The average board size is 13 and the average age of the firms in the dataset is approximately 3 years. FSIZE ranges from 3.36 to 12.02 and BSIZE from 5 to 21. Therefore, there are large firms as well as smaller firms in the sample. BSIZE only reports 712 observations, because not every firm reports its board size on Refinitv Eikon. I exclude the missing observations from the analysis. For LEV, the average value is 0.92, indicating a relatively low leverage level for the studied firms. Also, in FAGE there are varying outcomes for the age of the studied firms. The minimum of -0.63 indicates that the firm's age is less than one year, since it is stated as the natural logarithm of the firm's age, see Appendix Table A1.

The financial performance measures show varying characteristics. Compared to the other measures, TOBQ has a high standard deviation, which indicates a considerable dispersion in performance among the studied firms. The maximum value recorded reaches 90.06, which differs much for the minimal value of 0.03. Similarly for ROA, ROE, and ROS, the variation across the sample show considerable dispersion.

To check whether the data is homoscedastic and has a normal distribution, I conduct two tests. The first is called the Breusch-Pagan test. I formulate the following hypotheses:

H_0: Homoscedasticity is present. The error variance is constant.

H_A: Heteroscedasticity is present. The error variance is not constant.

Appendix Table A2 shows the test results for the Breusch-Pagan test. The table shows that most results have a *p*-value lower than the significance level of 5%. Therefore, I reject the null hypothesis and assume heteroscedasticity.

Next, I check whether the data has a normal distribution. A normal distribution is checked with the Shapiro-Wilk test. I formulate the following hypotheses:

H_0: The residuals in the model follow a normal distribution.

H_A: The residuals in the model do not follow a normal distribution.

Appendix Table A2 also shows the test results for the Shapiro-Wilk test. All results in the table have a *p*-value lower than the significance level of 5%. Therefore, I reject the null hypothesis.

To conclude from the checks above, I take the robust standard error for all variables to mitigate the unequal variance of errors across the different observations.

In summary, the data in Table 1 shows varying characteristics, with considerable dispersion observed in performance measures. The Breusch-Pagan and Shapiro-Wilk tests reject the assumptions of homoscedasticity and normal distribution, respectively, leading to the use of robust standard errors.

5.3 Correlation matrix

Table 2 presents the Pearson correlations among the study variables. The values range from -0.216 to 0.403. This means that there are no strong relationships between the variables provided. Interestingly, there are multiple variables that show statistical significance related to each other. Three out of four financial indicators are statistically significant with the percentage women on the board of a firm. For TOBQ, this includes a significance level of 5%. For ROA and ROE, the table shows an even more significant relationship with an 1% significance level, indicating that there is less than 1% probability of obtaining the observed correlation coefficient by chance alone. Therefore, the table suggests that the observed relationship between %WOMEN and TOBQ, ROA, and ROE are unlikely to be due to random variation alone. To add, TOBQ and ROE are negatively correlated with %WOMEN, which means that firms with more women on the board on average have a lower financial performance. For ROA, Table 2 shows a positive correlation. This means that the more women on the board of a firm, the higher the performance with regards to ROA.

Furthermore, Table 2 shows multiple significant positive relationships between the control variables. To highlight, a higher FSIZE is significantly correlated with a higher BSIZE and LEV. Also, a higher BSIZE correlates positively with FAGE.

In summary, Table 2 shows no strong relationships among the study variables, but significant correlations exist between %WOMEN and TOBQ, ROA, and ROE. The relationships suggest that firms with more women on the board tend to have lower financial performance in terms of TOBQ and ROE, but higher performance in terms of ROA.

Table 1

Summary statistics.

Variable	*N*	*Mean*	*S.D.*	*Min*	*P1*	*Median*	*P99*	*Max*
%WOMEN	1003	0.22	0.17	0.00	0.00	0.20	0.78	1.00
FSIZE	1019	8.78	1.70	3.36	3.86	8.87	12.02	12.02
BSIZE	712	13.36	3.33	5.00	5.11	13.00	21.00	21.00
LEV	1017	0.92	1.12	-1.32	-1.13	0.62	6.13	6.22
FAGE	1030	3.15	0.99	-0.63	-0.45	3.42	4.15	4.23
TOBQ	1019	3.58	8.10	0.03	0.03	0.99	41.87	90.06
ROA	1007	0.96	1.34	-6.78	-6.34	1.04	5.41	6.32
ROE	995	0.10	0.15	-0.51	-0.42	0.10	0.54	0.89
ROS	1017	0.15	0.29	-0.63	-0.63	0.09	1.68	1.68

Notes: The table presents the summary statistics among the main variables used in this study. Refer to Appendix Table A1 for the variable definitions.

Table 2

Correlation matrix.

		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	%WOMEN	1.00								
2	FSIZE	0.007	1.00							
3	BSIZE	-0.005	0.403***	1.00						
4	LEV	-0.039	0.246***	0.078*	1.00					
5	FAGE	0.117**	0.043	0.278***	-0.026	1.00				
6	TOBQ	-0.092*	-0.216***	-0.133***	-0.198***	0.105**	1.00			
7	ROA	0.115**	-0.013	-0.024	-0.094*	0.018	0.026	1.00		
8	ROE	-0.111**	-0.058	-0.018	0.044	0.075	0.175***	0.179***	1.00	
9	ROS	-0.018	-0.011	-0.058	0.060	0.033	0.061	0.120**	0.292***	1.00

Notes: The table presents the correlation matrix among the main variables used in this study. Refer to Appendix Table A1 for the variable definitions. $^{*}p$ $^{**}p$ $^{***}p<0.05$.

6. RESULTS

6.1 Plots Analysis

Figure 2 shows the relationships between the dependent variables over time. The double-dash lines indicate the non-treated, or control group, and the solid lines indicate the treated group. For each financial performance measure, the relationship is plotted. The treatment period, also the policy time, is indicated with a dotted vertical line in 2011. This is the year when the policy is implemented.

Figure 2a shows the relationship for the financial performance measure TOBQ. Before the policy intervention, the lines show a parallel trend with some degree of deviation. After the policy in the year 2013, the graph shows a stagnation for the treated group based on its financial performance. But, from 2014 the performance starts to decrease in a quick pace. This is just after the policy in 2013, which is in line with hypothesis 2. It states that the performance of firms is negatively influenced by the policy change of gender quotas.

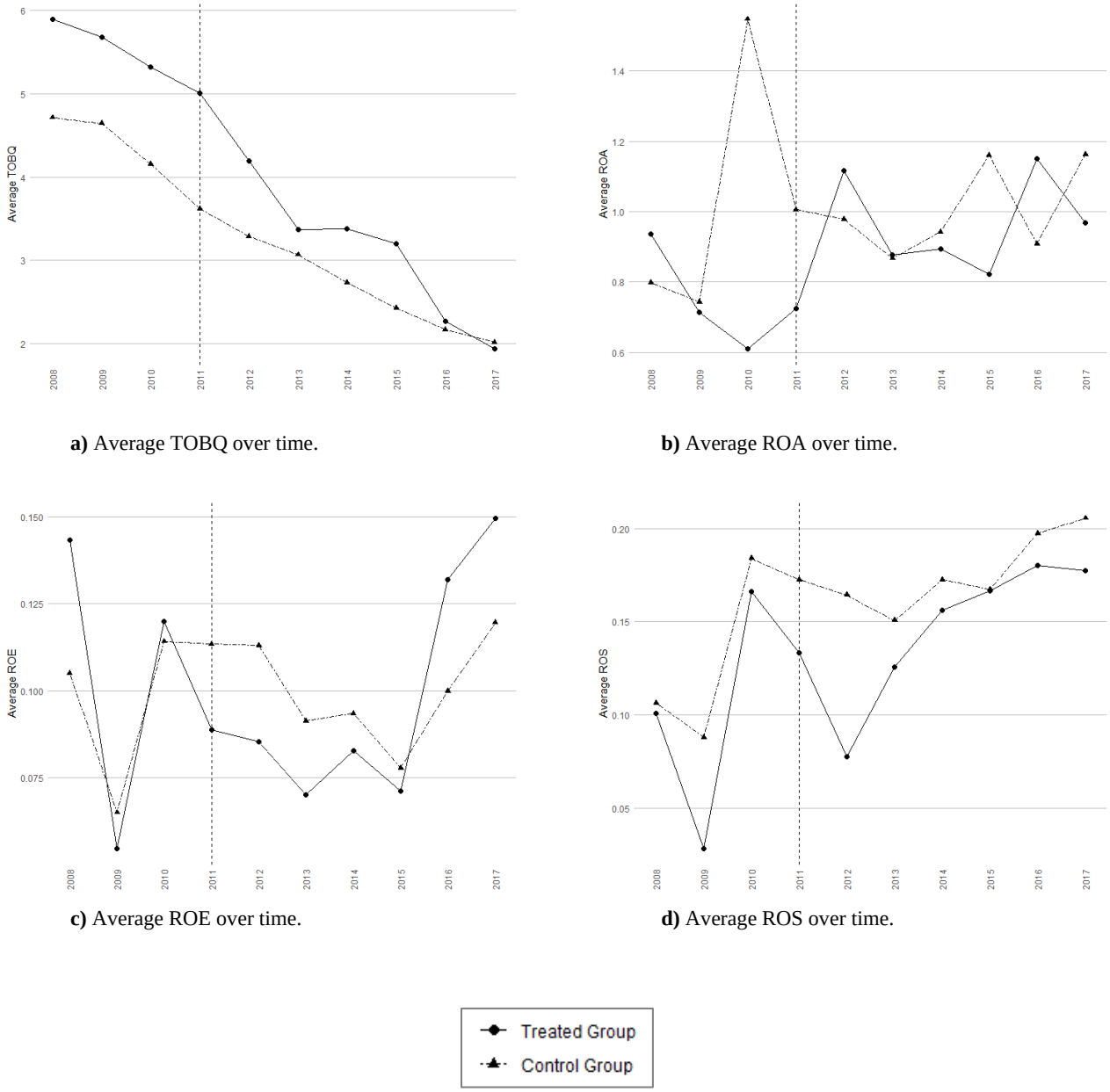
With regards to ROA, Figure 2b shows no clear relationship between the treated group and the control group before the policy. This lack of a pre-policy relationship indicates that the observed changes in the performance measure after the policy change are less likely to be attributed to the policy change. In this case, the Parallel Trends Assumption required for the DiD analysis may not hold. Pre-existing differences between the two groups can influence the outcome variable independently of the policy intervention. This is in line with hypothesis 3, which states that there is no significant relationship between board gender quotas and the financial performance of companies.

For the average ROE over time, Figure 2c shows a more parallel trend before the policy. Therefore, the trend after the policy intervention could say something about gender quotas. After 2010, the figure shows a lower ROE for the treated group than the control group. On the other hand, after 2015 the trend shows a steeper increase for the treated group than the control group.

Lastly, the average ROS over time in Figure 2d shows a considerable parallel trend between the two groups. After the policy change, the graph shows a significant decrease for the performance of the treated group compared to the control group.

From 2012, the performance of the treated group starts to increase quickly and reaches the same level as the control group in 2015.

In summary, the treated group's performance stagnates after the policy implementation in 2013 and decreases rapidly from 2014 for TOBQ, supporting the hypothesis that gender quotas negatively influence firm performance. However, for ROA, no clear relationship is observed before the policy, suggesting that the policy change may not be responsible for the post-policy changes. Similarly, for average ROE, the trend after the policy suggests lower performance for the treated group, while for average ROS, the treated group initially experiences a significant decrease but gradually catches up with the control group.



a) Average TOBQ over time.

b) Average ROA over time.

c) Average ROE over time.

d) Average ROS over time.

Figure 2. Financial performance measures over time for treated and control groups for a: TOBQ, b: ROA, c: ROE and d: ROS.

6.2 Regression results

6.2.1 Market-based performance

Table 3 shows the results for the market-based measure. Columns (1) and (2) present the OLS method, in which Column (1) presents the analysis without control variables. It compares the average change in the outcome variable between the treated and control group before and after the policy change. Column (2) shows the analysis including control variables for the OLS method. Column (3) presents the analysis for the fixed effects method. The rows "Year FE?" and "Firm FE?" show whether the fixed effects are taken into account in the model. The fixed effects are the variable Year, which allows to control for any time-specific factors that may affect the outcome variable. The Firm fixed effects control any unobserved heterogeneity. For each firm, it captures the firm-specific effects.

The coefficients for the LOW variable represent the average difference in the outcome variable between the treatment group and the control group. Table 3 shows varying results. The first method shows a strong positive coefficient, while the second method shows a strong negative coefficient. However, both coefficients are insignificant.

The coefficients for the POST variable represent the average change in the outcome variable over time for both the treatment and control groups. It compares the average trend before and after the policy. Table 3 shows two strong negative coefficients. The coefficients for the OLS method have negative coefficients. For the method without control variables, this coefficient is statistically significant at the 5% significance level. This indicates that the average TOBQ is lower after the policy change than before.

The control variables are only relevant for the second and third model. FSIZE, BSIZE, and LEV present negative coefficients for both models. For the OLS model, these are all statistically significant at the 1% level. This is also the case for FSIZE for the fixed effects method. For FAGE, Table 3 shows positive coefficients, for which OLS is statistically significant.

The coefficient of the average treatment effects shows the overall impact of the policy intervention on the outcome variable. This is indicated in the LOW x POST row of Table 3. The first model shows a negative relationship and both models including control variables show a positive relationship. Interestingly, all treatment effects are not statistically significant at the significance level of 5%, which suggests that the observed relationship between the variables may be due to random change rather than a true relationship in the dataset. This supports the third hypothesis, which states that board gender quotas have no significant effect on the firm's financial performance.

In summary, the coefficients for the LOW variable are inconclusive as they show both positive and negative values without statistical significance. The coefficients for the POST variable indicate a significant negative relationship between the policy intervention and financial performance, while the control variables exhibit significant associations with the outcome variable. The coefficients for the average treatment effect indicate no statistically significant relationship, supporting the third hypothesis.

Table 3

Regression results for the market-based measure.

	TOBQ		
	OLS		*FE*
	(1)	*(2)*	*(3)*
LOW	1.121	-1.685	
	(1.271)	(1.543)	
POST	-1.745*	-1.985	
	(1.021)	(1.408)	
LOW x POST	-0.575	0.930	0.939
	(1.355)	(1.538)	(0.588)
FSIZE		-1.069***	-4.613***
		(0.277)	(0.925)
BSIZE		-0.205***	-0.038
		(0.074)	(0.060)
LEV		-1.086***	-0.148
		(0.172)	(0.093)
FAGE		1.319***	0.671
		(0.358)	(0.475)
Year FE?	No	No	Yes
Firm FE?	No	No	Yes
Observations	1,019	662	662
R^2	0.014	0.102	0.899
Adjusted R^2	0.011	0.092	0.884
Residual Std. Error	8.054 (df = 1015)	7.332 (df = 654)	2.620 (df = 574)
F Statistic	3.858*** (df = 3; 1015)	8.672*** (df = 7; 654)	

Notes: The first two columns present the ordinary least squares method. Column (1) for the model without control variables and Column (2) with control variables. Column (3) presents the results for the fixed effects method. Year and firm fixed effects are controlled in the FE model. The robust standard error of each coefficient is shown in parentheses. $^{*}p^{**}p^{***}p<0.05$.

6.2.2 Accounting-based performance

Table 4 shows the regression results for the accounting-based measures. As in Table 3, for each variable the first two columns represent the OLS method and the third column represents the FE method. Therefore, there are nine columns for the accounting-based measures ROA, ROE, and ROS.

Overall, the LOW variable shows different results for the accounting-based measures. For ROA, Table 4 shows significant negative relationships. However, ROE and ROS present weak coefficients which are not statistically significant at the 5% level. The POST variable also shows weak coefficients. Only the OLS method without control variables for ROS shows a statistically significant positive coefficient for the 1% significance level, indicating strong evidence of a positive relationship.

Table 4 presents varying coefficients for the control variables. ROA shows only negative coefficients. However, these are not statistically significant, indicating that the control variables do not have a substantial impact on the ROA. For ROE, Table 4 shows two statistically significant positive coefficients. For ROS, Table 4 only shows weak coefficients. The Fixed Effects model shows a positive significant coefficient for FSIZE and a negative significant coefficient for LEV.

Again, the outcomes for the treatment effect are represented with the coefficients in the row LOW x POST. Interestingly, Table 4 shows positive effects for ROA, negative effects for ROE and also negative for the OLS models regarding ROS. However, there are no statistically significant coefficients. This suggests that the combined influence of gender quotas and the post-policy period does not significantly affect the financial performance of firms, which supports the third hypothesis.

In summary, the regression results in Table 4 reveal that the LOW variable has significant negative relationships with ROA, while exhibiting weak and statistically insignificant coefficients for ROE and ROS. The POST variable also demonstrates weak coefficients. Control variables exhibit a mixed pattern of positive and negative relationships, but mostly show weak coefficients. The treatment effect does not yield statistically significant results, indicating that the combined impact of gender quotas and the post-policy period does not significantly influence firm performance, supporting the third hypothesis.

Table 4

Regression results for the accounting-based measures.

	ROA			ROE			ROS		
	OLS		*FE*	*OLS*		*FE*	*OLS*		*FE*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
LOW	-0.276*	-0.554**		0.011	0.028		-0.026	0.028	
	(0.215)	(0.277)		(0.020)	(0.023)		(0.031)	(0.038)	
POST	-0.026	-0.034		0.006	-0.014		0.050**	0.025	
	(0.134)	(0.119)		(0.010)	(0.012)		(0.023)	(0.022)	
LOW x POST	0.211	0.440	0.394	-0.015	-0.017	-0.021	-0.004	-0.008	0.012
	(0.232)	(0.272)	(0.276)	(0.023)	(0.026)	(0.020)	(0.038)	(0.043)	(0.039)
FSIZE		-0.014	-0.245		-0.005	0.049*		0.004	0.052*
		(0.051)	(0.274)		(0.005)	(0.026)		(0.012)	(0.027)
BSIZE		-0.007	-0.027		-0.001	-0.001		-0.007	-0.002
		(0.019)	(0.041)		(0.002)	(0.003)		(0.004)	(0.005)
LEV		-0.104	-0.076		0.007	0.002		0.015	-0.036**
		(0.070)	(0.177)		(0.011)	(0.021)		(0.010)	(0.014)
FAGE		-0.003	-0.376		0.018**	0.010		0.022	-0.022
		(0.080)	(0.355)		(0.007)	(0.029)		(0.014)	(0.025)
Year FE?	No	No	Yes	No	No	Yes	No	No	Yes
Firm FE	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,007	662	662	995	656	656	1,017	662	662
R^2	0.004	0.025	0.116	0.0005	0.023	0.501	0.008	0.014	0.687
Adjusted R^2	0.001	0.015	-0.018	-0.003	0.012	0.425	0.005	0.004	0.640
Residual Std. Error	1.343 (df = 1003)	1.263 (df = 654)	1.284 (df = 574)	0.152 (df = 991)	0.129 (df = 648)	0.098 (df = 568)	0.288 (df = 1013)	0.251 (df = 654)	0.151 (df = 574)
F Statistic	0.809 (df = 3; 1003)	1.387 (df = 7; 654)		0.197 (df = 3; 991)	1.791** (df = 7; 648)		3.005** (df = 3; 1013)	1.917* (df = 7; 654)	

Notes: The left panel presents the results for return on assets, the middle panel for return on equity and the right panel for return on sales. Columns (1), (4), and (7) present the ordinary least squares method without control variables. Columns (2), (5), and (8) present the ordinary least squares method with control variables. Column (3), (6) and (9) present the fixed effects method. Year and firm fixed effects are controlled in the FE model. The robust standard error of each coefficient is shown in parentheses. $^{*}p$ $^{**}p$ $^{***}p<0.05$.

7. CONCLUSION

This study aims to provide more insight in the effect of board gender quotas on the financial performance of companies. France has adopted the Copé-Zimmermann Law in 2011, which entered in 2013 to include 20% women on their corporate boards. Effective as from 2017, a minimum of 40% females on boards has to be met. This research aims to study the relation between board gender quotas and firm performance before and after the implementation of the policy change. Based on a Differences-in-Differences analysis on 108 firms from the SBF120, I conduct three different tests based on two methods: Ordinary Least Squared method and Fixed Effects method. For the OLS method, I do both a test with and without control variables.

This research investigates four different financial measures. Market-based measure Tobin's Q and accounting-based measures Return on Assets, Return on Equity and Return on Sales. For both the market-based performance as well the accounting-based performance, the results show no significant relationships for the treatment effects. This suggests that firms with a lower percentage of women on their board do not experience a substantial difference in financial performance compared to firms with a higher percentage of women on their board. This supports other research stating that there is no significant market reaction of firm performance to female additions (Marinova *et al*, 2016; Farrell & Hersch, 2005). Also, Hermalin and Weisbach (1991) argue that board composition does not matter for company performance. Therefore, these findings support the third hypothesis.

The empirical evidence in this study helps to get a better understanding of the effect of board gender quotas on the financial performance of firms. With the implementation of the Rixain Law in 2021, large French companies will be required to have a proportion of at least 30% in their senior executives and members of their management bodies as of 2026. This research finds supportive evidence that there is no significant effect on the financial performance of the affected firms of gender quotas.

8. ACKNOWLEDGEMENTS

I would like to express my sincere thanks to my first supervisor, dr. L. Shen. Your essential advice, critical view, quick replies, constructive feedback and guidance through the whole process have helped and motivated me greatly. We've had some setbacks and difficulties with for example gathering the data, but because of your quick help I have always been able to get enthusiastic to continue solving these issues. Additionally, I would like to thank my second supervisor, prof. dr. L. Spierdijk. Thanks for the feedback. I am grateful you had the confidence that I would be able to deliver a finished thesis based on my pre-final version.

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10. APPENDICES

Table A1

Variable definitions and sources.

Variable	*Definition*	*Source*
%WOMEN	Number of women directors divided by the total number of directors.	Carter *et al* (2003)
FSIZE	Natural logarithm of total assets in millions.	Campbell & Minguez-Vera (2008)
BSIZE	Number of directors on the board of a firm.	Carter *et al* (2010)
LEV	Total debt outstanding at the end of each year divided by the total assets at the end of each year.	Campbell & Minguez-Vera (2008)
FAGE	Natural logarithm of the number of years since the incorporation of the firm.	Carter *et al* (2010)
TOBQ	Market capitalisation divided by the total assets. Firm's market value to its book value.	Adams & Ferreira (2009)
ROA	Net income before extraordinary items divided by the book value of total assets.	Adams & Ferreira (2009)
ROE	Net income before extraordinary items divided by the total of shareholders equity.	Joecks *et al* (2013)
ROS	Net income before extraordinary items divided by the total of sales.	Lückerath-Rovers (2011)

Notes: This table presents the variable definitions and sources for the main variables used in this study. These are the percentage of women (%WOMEN), firm size (FSIZE), board size (BSIZE), leverage (LEV), firm age (FAGE), Tobin's Q (TOBQ), return on assets (ROA), return on equity (ROE), and return on sales (ROS).

Table A2

Test results Breusch-Pagan test and Shapiro-Wilk test.

Model	*Type*	*Breusch-Pagan*	*Shapiro-Wilk*
TOBQ (1)	OLS without control variables	0.017	0.000
TOBQ (2)	OLS with control variables	0.000	0.000
TOBQ (3)	Fixed Effects	0.000	0.000
ROA (1)	OLS without control variables	0.001	0.000
ROA (2)	OLS with control variables	0.031	0.000
ROA (3)	Fixed Effects	0.031	0.000
ROE (1)	OLS without control variables	0.000	0.000
ROE (2)	OLS with control variables	0.000	0.000
ROE (3)	Fixed Effects	0.000	0.000
ROS (1)	OLS without control variables	0.330	0.000
ROS (2)	OLS with control variables	0.001	0.000
ROS (3)	Fixed Effects	0.001	0.000

Notes: This table presents the test results for the Breusch-Pagan test and Shapiro-Wilk test. The test results represent the *p*-values for both tests. For each financial performance measure, the table presents three models. The first model is the model without control variables, the second is the model with control variables and the third is the fixed-effects model. Respectively for TOBQ, ROA, ROE, and ROS.